



Carrier University SEMINAR & LECTURE SERIES

HVAC DESIGN & APPLICATION TOPICS

A series of presentations made available to enable you to make local presentations to HVAC designers and owners. This section helps to improve knowledge on current topics of interest to the HVAC community. These seminars qualify for CEU/PDH credits, and cover topics from fundamentals, codes and standards, equipment applications and technology.

LECTURE SERIES ■

Lectures are presentations given at a local facility and presented by an industry expert. These presentations are intended to help improve knowledge on current topics of interest to the HVAC community. These seminars qualify for CEU/PDH credits, and cover topics from fundamentals, codes and standards, equipment applications & technology.

Please reach out to your **local Carrier sales expert** for more information on having a lecture series topic delivered.



ON-DEMAND SEMINARS ■

Several state licensing boards approve the use of the IACET process as evidence that a presentation is non-commercial and has educational value for the engineer. The IACET process requires that Carrier University can show each individual who wants to claim CEUs has achieved the learning objectives of the course or seminar at an acceptable level. For Carrier's TDP and Online Seminar Series, this is done by taking an online Knowledge Check.

HOW TO ACCESS CARRIER UNIVERSITY ONLINE

Carrier University Online is Carrier Commercial HVAC's learning management system. Users will be required to create an account or modify their current profile to access training materials.

CREATE A NEW ACCOUNT

1. Sign up using this link: [Carrier University Training for Credit](#)
2. Guest Audience key is: **Credit**

EXISTING ACCOUNTS

1. Sign in to Carrier University. At the top right corner, click **Profile**
2. Edit your profile and look for the field labeled **(cu-ext) Profile Info - General (CU CE Info)**
3. Enter **Credit** in the Guest Audience Key field
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To be put into the correct audience on our site, users will need to enter the "Guest Audience Key" when registering their account. This will provide you with visibility to the below topic categories along with all of the individual courses that are within each respective category. All registrants will be given complimentary access to our **"Seminar Series"**.

FORMAT KEY:	■ Live/In-Person *If interested in this topic, please reach out to your local sales representative to check availability.* ■ Online/On-Demand	
Topic Area	Course # & Format	Title & Course Description
Chilled Water Systems	■ LVSEM001 ■ OLSEM001	Water-Cooled Centrifugal Chillers This seminar covers the fundamentals of centrifugal chillers. In addition, it will identify codes and standards that apply to chiller equipment. Discussion includes basic refrigeration cycle, chiller components, compressor operating details and capacity control methods.
Chilled Water Systems	■ LVSEM004 ■ OLSEM004	Chiller Plant Fundamentals A chilled water plant design consists of multiple components interconnected by piping to form an efficient way to provide cooling and heating for a large building or facility. This seminar explains the basic water-cooled chiller plant design and its components. Each component of a chiller plant design is discussed along with an overall efficient plant control strategy.
Chilled Water Systems	■ LVSEM008 ■ OLSEM008	Chiller Plant Design: Constant Flow Chiller Systems A constant flow system is the simplest chilled water design to operate. Constant speed pumps provide a fixed quantity of water to the system at all times, controlled by 3-way valve control at the air handler coils. At low load building operation, the chilled water flow is by-passed around these coils. This seminar discusses the benefits and disadvantages of a constant flow design, comparing various chilled water supply temperatures and return chilled water options. The impact of energy use of these options will be demonstrated.
Chilled Water Systems	■ LVSEM011 ■ OLSEM011	Chiller Plant Design: Variable Flow Chiller Systems This seminar discusses the design and benefits of variable flow chiller plants. ASHRAE Standard 90.1 requirements make the use of variable flow chiller systems nearly mandatory design. However, without proper design considerations the energy savings will not be realized and potential operational issues may occur. This seminar looks at the various design options and considerations and impact on energy and performance.
Chilled Water Systems	■ LVSEM039	If You Can't Take the Heat ... Utilizing Heat Recovery Effectively Some applications such as hospitals and hospitality have a constant need of heating energy even during the hottest days of the year and these same facilities often need to run chillers during the coldest days. Engineers often question what chiller technology will most efficiently recover what is otherwise wasted energy. This presentation evaluates how screw and centrifugal chiller technology can best be applied to efficiently recover the rejected energy. The best solution depends on part load performance and chiller piping arrangements.
Chilled Water Systems	■ LVSEM040	High-Performance Water-Cooled Chiller Design for Mid-Range Applications Strategies This seminar compares types of chiller compression and how load and lift are impacted by each. In addition the results of ASHRAE Research Projects 601 and 751 are discussed and how to evaluate chiller performance and strategies for staging chiller plants to optimize performance.
Chilled Water Systems	■ LVSEM041	Using Water-Cooled Chillers to Exceed ASHRAE Minimum Efficiency Standards by 50% ASHRAE 90.1 requirements have continued to become more stringent with each revision to the standard. The impact on chiller efficiency has led many to believe that little more can be done to improve efficiency of chillers. This seminar looks at how the selection of the type of chiller and how by taking advantage of its operating envelope, as well as the use of a series counterflow piping arrangement can result in over a 50% improvement over the ASHRAE 90.1 Standard.
Codes & Standards	■ LVSEM003 ■ OLSEM003	How ASHRAE 90.1-2010 Impacts the Mechanical Engineer This seminar discuss the requirements of ASHRAE 90.1 2010 in the areas of building envelope, lighting, power and equipment efficiencies. In addition, topics such as economizer, reheat requirements, fan design limitation calculation and heat recovery requirements are presented.
Codes & Standards	■ LVSEM005 ■ OLSEM005	ASHRAE Standard 55 Designing for Comfort Designers often think that determining comfort conditions is as easy as using 75°F and 50% RH for design conditions. However, if you are doing a LEED® analysis the ASHRAE 55 Standard must be used to define comfort conditions. The standard requires looking at six primary factors and using the predicted mean vote procedure that determine if comfort conditions will be achieved. In addition it evaluates these conditions at different seasons of the year. This presentation provides guideline on how to comply with the standard and the methods used in a LEED® analysis.
Codes & Standards	■ LVSEM006 ■ OLSEM006	ASHRAE Standard 62.1 Impact on Mechanical Design ANSI/ASHRAE Standard 62.1 "Ventilation for Acceptable Indoor Air Quality" endeavors to achieve the necessary balance between IAQ and energy consumption by specifying minimum ventilation rates and IAQ that will be acceptable to human occupants. This seminar addresses the three components of the standard, source control, filtration and dilution. The various types of filtration and how they can help compensate for outside air quality and how filtration can be used to improve system efficiency are also covered.

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Codes & Standards	LVSEM007 OLSEM007	How ASHRAE Standard 189.1 Impacts the Mechanical Engineer This seminar addresses how ASHRAE Standard 189.1 and LEED® will co-exist in the industry. Comparisons are made as to where requirements are the same and where they are different. ASHRAE 189 is anticipated to begin showing up in building codes in the near future and it is imperative that engineers and designers understand how these two important documents interact.
Codes & Standards	LVSEM009 OLSEM009	LEED® Version 4 Impact on Mechanical Design The LEED® rating system has been evolving since its inception in 1998. LEED® V4 has been out for a few years but after October 31, 2016 it is required for all new projects. This new version makes some major shifts in execution as it moves from prescriptive to performance based results. This presentation will address the key impacts of version 4.0 changes on mechanical design in commercial buildings.
Codes & Standards	LVSEM014 OLSEM014	Mechanical & Electrical System Impact of IECC 2015 - Introduction International Energy Conservation Code 2015 has been adopted in 12 states in the USA as of December 2017. The IECC-2015 code has a number of new requirements which impacts the application of HVAC equipment and method of compliance with the requirements. This seminar examines the new requirements and available methods of compliance. This is one of 3 on the subject the other two are more detailed discussions on the impacts on chilled water and DX systems.
Codes & Standards	LVSEM021 OLSEM021	Mechanical & Electrical System Impact of IECC 2015 – CW Systems International Energy Conservation Code 2015 has been adopted in 12 states in the USA as of December 2017. The IECC-2015 code has a number of new requirements which impacts the application of HVAC equipment and method of compliance with the requirements. This seminar is the one of 3 on this topic. These seminars provide an overview of the code and examine the new requirements and available methods of compliance. This seminar looks at specific requirements on CW systems.
Codes & Standards	LVSEM033	Optimizing Ventilation Design: The ASHRAE Multi-Space Equation Arriving at the correct ventilation system design for a multiple-zone application using the ASHRAE Standard 62.1 Ventilation Rate Procedure is not a simple task. There are many variables that must be factored into the process some of which include complex equations. Arriving at the optimized ventilation system design for a multiple-zone application requires further analysis. Software evaluation of multiple scenarios may be required to arrive at the most cost effective quantity of ventilation while maintaining good IAQ. This seminar walks through the VRP method and how to use software simulations to optimize ventilation.
Heat Recovery & Heat Pump Systems	LVSEM044	Electrified Heating: Air-Sourced Equipment and Applications This seminar discusses various piping schematics of systems, analysis of unit performance, the effect of the defrost cycle as well as system design considerations to properly apply heat pumps. After completing this training, audiences will be equipped to confidently evaluate, specify, and integrate air-to-water heat pump systems in building projects, applying best practices for decarbonization, regulatory compliance, and energy efficiency; they will understand how to analyze system performance, navigate policy impacts, and make informed decisions that support sustainable building operations and future-ready HVAC solutions.
Mechanics of Chiller Solutions	LVSEM012 OLSEM012	How Cold is Cold? This seminar discusses how weather impacts chiller performance and how a system can be designed to optimize the chiller plant for cold condenser water operation. Also reviewed is how chiller construction can be used to leverage cold condenser water and the associated energy savings.
Mechanics of Chiller Solutions	LVSEM013 OLSEM013	Chilled Water System Low Delta T Syndrome This seminar address causes of Low Delta T Syndrome, which causes additional chiller and pump energy to be consumed in order to maintain design load. Several design and operational techniques are examined to minimize Low Delta T Syndrome in chilled water plants.
Mechanics of Chiller Solutions	LVSEM015 OLSEM015	Waterside Economizer in Chilled Water Systems ASHRAE Standard 90.1 2013 requires eliminating mechanical cooling at ambient conditions below 50F DB/45F WB. This seminar describes how to incorporate an integrated waterside economizer into a chilled water system and demonstrates using modeling tools for proper application of the economizer and optimization of the chiller plant.

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Mechanics of Chiller Solutions	■ LVSEM027 ■ OLSEM027	Hydronics & the Effects of Variable Speed Screw Chillers The piping system used on screw chillers has an impact on their performance. This presentation looks at how the chiller plants hydronic system influences screw chiller operation at part load and why a good turn down ratio is important. Changing condenser water temperatures and varying system load represent a significant opportunity for energy savings but the chiller and the piping system must be designed to take advantage of the saving potential.
Mechanics of Chiller Solutions	■ LVSEM031 ■ OLSEM031	Air-Cooled Chiller Solutions for Low Ambient Applications ASHRAE 90.1 2016 is now being adopted by many states and there is a clear requirement for air or waterside economizer, but there are different ways to meet such requirements. Engineers need to understand the requirements of the new standard and the design options available to satisfy the standard. This seminar will address how requirements can be met with air-cooled chillers.
Mechanics of Chiller Solutions	■ LVSEM036	Introduction to Chiller System Optimization This presentation looks at tools an engineer can use to determine the most cost and energy effective solution to chiller projects. There is no one solution that is the perfect system for all applications. Things like system load, weather conditions and chiller performance make nearly every project unique. In this presentation the steps of evaluating these various influences on energy and economic performance are evaluated by using a step by step evaluation process.
Mechanics of Unitary Solutions	■ LVSEM002 ■ OLSEM002	How to Select the Proper Fan This seminar starts with the often forgotten fundamentals of the fan laws and reading fan curves and demonstrates how the best selection might not be the larger size. Forward curve fans have been the popular choice for years but in recent years the use of plenum fans has become more common. This seminar explores where the use of plenum fans best fit and how to apply them to achieve a cost effective and energy efficient solution.
Mechanics of Unitary Solutions	■ LVSEM017	Dedicated Outdoor Air Systems: Balance Between IAQ & Energy This presentation will focus on the design of custom DOAS units with respect to providing adequate OA, and considering the IAQ procedure when the reduction of outdoor air pollutants is a concern. A system approach to combining DOAS units with chilled beam technology will be reviewed. Particular focus will be given to this combined strategy's energy savings potential as it is applied to LEED EA credits.
Mechanics of Unitary Solutions	■ LVSEM018 ■ OLSEM018	DOAS & Ventilation Applications This seminar defines the categories of 100% outdoor air equipment used in commercial applications. It covers the three outside design conditions as defined by ASHRAE and how they affect equipment selection. In addition, the presentation covers control sequences and application requirements.
Mechanics of Unitary Solutions	■ LVSEM023 ■ OLSEM023	High Performance Small VAV Rooftop Systems Engineers are constantly faced with specifying the most efficient HVAC system on buildings of all sizes. This decision becomes tougher on smaller (20K - 50K sq. Ft) buildings where historically they specify systems that they are comfortable with. But this choice may not provide the owner with the most efficient choice. This seminar will explore 4 of the most common systems for these size buildings and how climate zone can impact energy use and the final system selection.
Mechanics of Unitary Solutions	■ LVSEM034	Energy Saving Concepts for Water Source Heat Pump Systems & DOAS Reheat Strategies A popular system combination is WSHP units with a centralized DOAS system. This presentation identifies methods to enhance the efficiency of WSHP systems and reviews the various reheat systems available for packaged DOAS units.
Mechanics of Unitary Solutions	■ LVSEM035	Energy Saving Concepts for Water Source Heat Pump Systems WSHP systems are a widely popular system, due to their flexibility and high efficiency for both cooling and heating. With new advances in technology and design strategies, there are many ways to further enhance WSHP system efficiency. This presentation explores some of those efficiency enhancing concepts, such as waterside economizer, enhanced motor technologies, and utilizing DOAS units.
Mechanics of Unitary Solutions	■ LVSEM037	Reheat Strategies for DX Dedicated Outdoor Air Systems As Dedicated Outdoor Air Systems (DOAS) have gained in popularity, many different supply air control methods have arisen. Every one of these methods has something in common; a reheat system. This presentation explores the various types of DOAS reheat systems available, such as Hot Gas Reheat, Liquid Subcooling, and Sealed Refrigerant Loops; and describes how to apply reheat systems for various supply air control methods, such as neutral supply air, space sensible load offset, and space latent load offset.

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Mechanics of Unitary Solutions	■ LVSEM038	Free Cooling for Water Source Heat Pump Systems When properly applied, waterside economizers can be a power tool for energy savings in a WSHP system. By utilizing the cold ambient conditions to generate chilled loop temperature, the waterside economizer can provide “Free” system cooling. This presentation provides a path to understanding waterside economizers for WSHP systems and how to properly apply them for maximum energy savings.
Mechanics of Unitary Solutions	■ LVSEM052	WSHP Design & Application This WSHP Design and Application presentation provides a general overview of WSHP systems, an evaluation of key design considerations and associated best practices, and an analysis of system types and components. The course is intended to provide guidance to those involved or interested in WSHP unit and system design and selection.
Refrigerants	■ LVSEM010 ■ OLSEM010	Chiller Refrigerants for the Future The Montreal Protocol had a major impact on our industry and today’s concerns over GWP now appear to have the potential for similar changes. The US Government continues to push for regulations that will address the GWP issue and refrigerants are often considered in these regulations. Consulting engineers need to know the whole story and understand when and how it might impact their designs. This seminar will address the choices of refrigerants and the scope of the regulations and codes that impact refrigerant choices for chillers now and in the future.
Refrigerants	■ LVSEM026 ■ OLSEM026	Refrigerants in Closed Environments: Understanding ASHRAE Standards 15 & 34 The regulations to increase energy efficiency, while lowering GWP and ODP has raised concerns over the use of new refrigerants in HVAC equipment. New refrigerants may impact toxicity and / or flammability levels. Since this equipment is typically installed inside of the building, engineers must be aware of any changes to ASHRAE safety standards 15 & 34 and how that might effect their customers and employees.
Refrigerants	■ LVSEM029 ■ OLSEM029	Current & Future Chiller Refrigerants: 2019 Update Current changes to refrigerant regulations continue to impact the options and timing for implementation in chillers. This seminar will explore the refrigerants available today and look at the current regulations that govern them. A review of the Montreal Protocol, Kyoto Protocol, Kigali Agreement and SNAP will be examined for regulation and phase out impact. New refrigerant options will be compared for application, safety and ability to retrofit into existing equipment. Timing of how new refrigerants might be included in future building codes will be analyzed.
Refrigerants	■ LVSEM030 ■ OLSEM030	Refrigerants Past, Present, & Future Environmental issues have driven changes in the refrigerants used in air conditioning and refrigeration equipment. This workshop will provide a brief historical perspective of refrigerants that have been used in the past, a look at refrigerants that were introduced to deal with ozone depletion, and finally a look at refrigerants that are being considered down the road to reduce greenhouse gas emissions. We will also review changes being made to ASHRAE Standards 34 and 14 as well as the codes to deal with the new refrigerants.
Sustainability & Healthy Buildings	■ LVSEM016 ■ OLSEM016	Sustainability & Utility Rates This seminar addresses how utility demand structure is being influenced by sustainability issues including through LEED V4 Credits. Topics covered include how demand charges and demand programs are responding to these concerns and some of the solutions being used.
Sustainability & Healthy Buildings	■ LVSEM019 ■ OLSEM019	Proving World Class Energy Performance Executive order 13693 requires that federal agencies reduce energy intensity by 2.5% annually by 2020. The USGSA conducted a study in 2016 comparing two chiller technologies over four seasons to determine most efficient compressor technology over a range of application conditions. This seminar examines the new technology evolution in chillers and the impact on chiller efficiency. The impact of this technology on both water and air cooled chillers is covered.
Sustainability & Healthy Buildings	■ LVSEM028 ■ OLSEM028	Meeting IAQ Needs with Enhanced Filtration This presentation will review the commonly used design guides found in ANSI/ASHRAE Standard 62.1, “Ventilation for Acceptable Indoor Air Quality.” The two mechanical ventilation procedures the Ventilation Rate Procedure and the Indoor Air Quality (IAQ) Procedure are discussed. How the IAQ Procedure provides a directed approach by reducing and controlling the concentrations of selected air contaminants of concern through both dilution and enhanced air cleaning are explained.

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Sustainability & Healthy Buildings	■ LVSEM042	Optimizing Economic Value & Occupant Experience with Intelligent Buildings In the current economic environment building owners are more than ever faced with optimizing economic value of the building while maintaining occupant comfort and security. New intelligent buildings not only control energy use and maintain comfort but anticipate occupant needs. This presentation looks at the new trends in intelligent buildings. The use of building automation is described in providing customized comfort conditions, energy use dashboards and even elevator systems that optimize use and minimize occupant wait time.
Sustainability & Healthy Buildings	■ LVSEM045	Building Resiliency in Times of Climate Change From recent wildfires and air pollution to ongoing extreme heat, factors associated with climate change can have a significant impact on indoor environments. Carrier expert Brian Monk, PE, ASHRAE DL, will highlight how Carrier HVAC equipment, digital solutions and services can help improve outcomes and create greater resiliency in buildings moving forward.
VRF Systems	■ LVSEM063	Designing A2L VRF Systems-Overview and Application This training class is intended to help educate and simplify the different codes and standards that exist surrounding A2L usage with VRF systems; outline what is required for compliance with them, explain mitigation features and how to apply and design the system including unit size selection, placement and calculations from design software.



QUESTIONS?

For any questions relating to seminars or lectures, please contact **scott.hopkins@carrier.com**